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THEORY *and* PRACTICE

OF

Cement

Waterproofing



*The Waterproofing
and Construction Company*

35 WALL STREET

NEW YORK CITY



Cement

Waterproofing

Chap. I—Description

II—Comparison

III—Relative Advantages

IV—Specifications

V—Theory

REFERENCES, Etc.

*The Waterproofing
and Construction Company*

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PREFACE

WATERPROOFING by the application of a Cement Plaster Coat is becoming generally recognized as the Modern Method of Substructural Waterproofing. In many of the largest buildings throughout the country this system has been used exclusively, and in some cases the conditions imposed were exceedingly severe. Prominent architects, having become convinced of its merit both as to economy and efficiency are specifying it to the exclusion of all other types.

As this is the only successful Method of Waterproofing yet devised where the entire operation is carried to completion from the interior of the building, it is particularly applicable to the repair of completed structures, and considerable of our work is of this nature.

From the description which follows this Method of Waterproofing may appear simple, but it is the antithesis of this, for if good results are to be attained, a scientific proposition is presented, requiring the exercise of the greatest care and skill resulting from long experience.

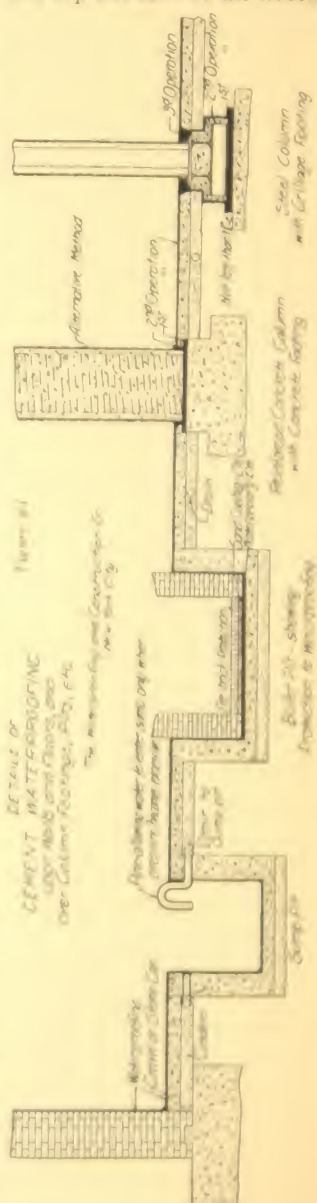
Our endeavors in the field of Waterproofing have been attended with uniform success, and without exception our contracts have been completed to the satisfaction of all concerned.

CHAPTER I.
DESCRIPTION

BY our system, a coating of Waterproof Cement is applied over the inside face of all walls and over the top surface of all floors.

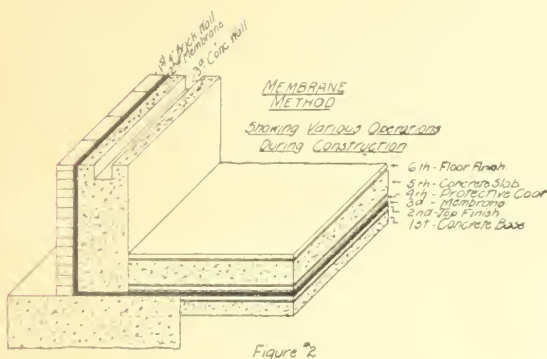
coming in direct contact with the earth. The coating is carried over all pits, trenches, etc., and either up the sides of the columns to the required heights where the design necessitates an intricate foundation system, or where a heavy foundation is not required it may be carried over the footings and up around the column bases to join with the floor waterproofing (see Fig. No. 11).

Sketches showing the general method to be pursued in carrying the coating continuous in the special cases for each individual structure, are submitted to the architect or engineer at his request, for approval before proceeding with the work.



CHAPTER II. COMPARISON

IN contradistinction to the simplicity of the Plaster Coat Method, note the numerous incidental operations necessary, where Pitch and Felt or some other membrane system is used, illustrated in Fig. No. 2.



The many operations required by the Membrane Method are no assurance of its success, but rather increase the possibilities of failure. If extreme care is not observed in its protection, the membrane is liable to become punctured and unless detected before covered over, the puncture may destroy the efficiency of the entire system.

CHAPTER III. RELATIVE ADVANTAGES

THE decided advantages of the Plaster Coat Method over the membrane type of Waterproofing may be summed up as follows:

1. It obviates the necessity of an exterior protective or supporting wall and the excavation for same.

2. It eliminates the excavation for, and the construction of a supporting base below the floor slab. The concrete of the floor slab can be placed as a monolith, adding greatly to its structural strength.

3. It includes besides the waterproofing medium, a sanitary and non-absorbent cement wall and floor finish. Furring, lathing and plastering are eliminated resulting in an increase in the available space as well as a reduction in cost.

4. Any injured portion can be easily cut out and replaced, which feature merits attention owing to the extreme difficulty in repairing leaks where once the membrane has failed.

All of these features should be considered in comparing the relative merits of the two systems. The estimate for the actual application of the membrane will usually be considerably less than that for the cement coating, but when all incidental charges are taken into account the total cost of Waterproofing will be greatly in favor of the Plaster Coat Method.

For convenience in comparing these costs we append the following summary:

Pitch and Felt Method

Cost of Membrane

- | | |
|---|--|
| 100 | Excavation outside of wall and below floor slab. |
| 100 | Brick supporting or protecting wall. |
| 100 | Furring and lathing. |
| 100 | Plastering. |
| 100 | Supporting base below floor slab. |
| 100 | Cement floor finish. |
| 100 | Painting or enameling if desired. |
| Value of space occupied by furring and lathing. | |

Waterproof Cement Plaster Coat Method

Cost of Waterproofing.

- | | |
|-----|-----------------------------------|
| 100 | Painting or enameling if desired. |
|-----|-----------------------------------|

CHAPTER IV. SPECIFICATIONS

Extent

THE inside face of all exterior walls and the upper surface of the floor slab of the basement shall be waterproofed by a continuous coating of Waterproof Cement, applied by THE WATERPROOFING & CONSTRUCTION COMPANY, No. 35 WALL ST., NEW YORK CITY, or other reliable contractor specializing in work of this nature.

Preparation of Surface

All surfaces to be waterproofed shall be thoroughly roughened by bush-hammering or other means, so as to present practically a new surface, and carefully cleaned by scrubbing with wire or rattan brushes and clean water. The masonry shall then be saturated with clean water, and the face painted with a heavy coat of cement grout.

Cement Coating

This shall be prepared by skilled mechanics only and shall consist of a 1:2 Cement Mortar of best quality Portland Cement and clean sand to which an approved Waterproofing Compound has been incorporated, all to be carefully proportioned, and thoroughly mixed.

Application

The coating shall be applied upon all horizontal surfaces in one operation to a thickness of not less than 1". Upon vertical surfaces it shall be applied in two coats, scratch and finish, the total thickness to be at least $\frac{3}{4}$ ". The coating shall be carried continuous over all pits, trenches, etc., and up the sides of the columns to grade [or over the column footings and up the sides of the bases to join with the floor waterproofing]. Under the fire-boxes of the boilers the Waterproofing shall be depressed 8" below grade to allow the placing of a protective sand cushion and a layer of fire-brick.

Unless otherwise specified the Waterproof Coating shall be trowelled smooth and dense, free from all imperfections and shall perform besides a waterproofing medium the additional function of a cement floor and wall finish.

Guarantee

The Waterproofing Contractor shall be required to give a written guarantee that all sections treated by him will be rendered watertight and damp-proof, and that for a period of two years he will repair without charge any leaks which may develop in his work, unless such be due to causes beyond his control.

CHAPTER V.

THEORY OF THE CEMENT PLASTER COAT
METHOD OF WATERPROOFING

THAT the waterproofing should be on the side of the water is axiomatic where the film or membrane method is used. Its truth is apparent.

With a cement coating where a wall is structurally strong enough to resist the hydrostatic head, positive results are obtained by applying the Waterproofing to the inside surfaces.

There are a great many persons who are sceptical as to the success of Waterproofing by the application of a cement coating where actual hydrostatic pressure exists. A radical departure from the trodden paths in any field of endeavor is met with more or less opposition and scepticism.

It is quite natural however, for anyone to whom the proposition is first presented, to inquire why the cement coating is not forced from the surface upon which it is applied, when the pressure is exerted upon the opposite face. To this query we reply that the coating is so perfectly bonded to the underlying base as to really become an integral part of it. Should it be attempted to remove any portion of this coating after it has been properly applied, it would be found that the bond is absolute and that it is practically impossible to separate the Waterproofing from the masonry at the line of cleavage.

Inquiry is also made as to how great is the hydrostatic pressure which a $\frac{3}{4}$ " surface application will withstand. Our reply is, that a structure subjected to any normal head of water can be successfully waterproofed, provided the masonry possesses sufficient structural strength to resist the pressure.

The function of waterproofing is to prevent the seepage of water through the pores and fissures of the masonry. The Waterproof Coating forms a series of beams or arches over these minute openings, and effectively seals the water in their separate channels. Although all excessive absorption of the masonry is destroyed by saturation before the application of the coating, some of the fine particles of cement are drawn into these pores, assisting in obtaining the desired bond.

The span of the beams is of course of infinitesimal length only, and thus the total force applied upon each individual beam and the consequent stresses exerted are of negligible magnitude; also it is quite probable that the pressure is lost to a large extent by the capillarity, depending for this feature upon the impermeability of the masonry itself. Only as long as the particles of water are confined within their tiny channels does the Cement Coating possess real efficiency for if the water be allowed to collect in a continuous sheet behind the Waterproofing, the beam becomes of appreciable length and the coating is ruptured or forced from its position.

Our Waterproof Cement Coating does not possess any remarkable structural strength, at least such strength should ordinarily not be considered. We will undertake to waterproof a structure only, where it has been properly designed to resist the pressure to which it is subjected, otherwise the masonry itself will fail and the efficiency of the Waterproofing be destroyed. Should a crack develop in the masonry from excessive settlement or from expansion and contraction, the Waterproofing will probably also be ruptured. Such a condition is by no means alarming however, as it is a simple matter to cut away the defective portion and replace it with new material.

Imnumerable claims are made for various compounds upon the market, and in some cases even coatings of paint are advertised as being capable of resisting enormous hydrostatic pressures. Such assertions are fundamentally in error, and we do not wish to be grouped with this class of "Miracle Workers." Damp-proof Paints should be used for superstructural work only, as they are quite ineffectual where pressure exists.

It proves an excellent investment to waterproof all buildings below grade even though water is not encountered during excavation. Water from underground streams and springs is likely to be forced into basement of the prospective building at any future time as a result of further development of neighboring property, and also it has been found exceedingly profitable to safeguard against the entrance of surface water. The damage resulting from a ruptured water main or a defective sewer often amounts to several times the sum that would originally have been expended to waterproof the entire substructure.

Waterproofing Compound is sometimes added to mortar in brickwork with a view of rendering the masonry impervious. This method of waterproofing is certainly not to be commended as ordinarily the mortar as used is very lean and porous and care is not taken in its placing to securely embed all bricks and fill all voids. If a dense mortar were used and all necessary precautions taken to insure satisfactory results, the additional cost would be excessive.

Considering the merits and demerits of all methods of Waterproofing from an unprejudiced viewpoint it will be conceded that the Waterproof Cement Plaster Coat Method is far superior to any system yet devised, and we feel safe in predicting that before many years have elapsed this method will be used exclusively for substructural waterproofing.

Some Specific Instances Illustrating the Efficiency and Economy of Our Methods

The Union Mortgage Co., No. 100 Broadway, Mr. Wm. C. Adams, President, asked for estimates for waterproofing the basement of their building No. 126 East 39th street, where water had entered in a steady stream for many years.

Several proposals ranging from \$500 to \$1,000 were received from other Waterproofing Companies, but our experience convinced us that it was necessary to treat but a section of the walls. The total cost was only One Hundred and Twenty-five (\$125.00) Dollars, and the work as performed by us resulted in rendering the entire basement watertight and damp-proof.

The F. & L. Construction Company, No. 45 W. 34th Street, awarded the contract for waterproofing the basement of their buildings Nos. 115-127 West 30th Street, to the manufacturers of a well-known Waterproof Compound.

The work was done by the company in a very careless manner, due to their lack of experience in construction work and the waterproofing was a complete failure, causing considerable loss and annoyance to the tenants.

We removed the entire floor top finish and relaid same, properly bonding the new top-finish to the underlying concrete and carried the waterproofing continuous up all walls to grade, with highly satisfactory results.

Mr. Samuel Jacobs, Treasurer of the Edgemere Crest Realty Co., No. 30 East 42d street, experienced considerable trouble from the infiltration of approximately 10,000 gallons of water per hour through the manholes at Edgemere Crest, located only a few hundred feet from the Atlantic Ocean.

A one (1") Inch Waterproofed Cement Plaster Coat was applied to the inside face of these manholes without relieving the hydrostatic pressure, entirely preventing further infiltration.

Mr. J. F. A. Clark, of the firm of Messrs. Clark & Childs, Stock Brokers, No. 111 Broadway, owner of the residence No. 1014 Fifth avenue, had experienced considerable annoyance from water entering through the sub-cellar walls.

Several leading Membrane Waterproofing Contractors were called upon for advice, and to submit their proposals for remedying the condition.

Our estimate for overcoming all annoyance and rendering the entire sub-cellar watertight was the sum of ONE HUNDRED AND THIRTY (\$130.00) DOLLARS, one-fifth to one-tenth the estimates of other Waterproofing Companies, who did not propose to take advantage of the peculiar conditions existing there.

The membrane waterproofing of the building owned by Messrs. Redmond & Company, Bankers, No. 31 Pine street, failed completely, owing to a break of the steam line in the street, allowing infiltration through the basement walls. In order to repair the membrane it would have been necessary either to open the street and cut away an 8" brick protective wall or to remove a 12" inside brick wall to expose the waterproofing. The cost in either case would have been very great and would have caused considerable inconvenience. In three days, at a cost of One Hundred (\$100.00) Dollars we applied a 1" Waterproof Cement Plaster Coat to the defective walls, rendering the basement watertight.

Shelves have been built against the Waterproofed Coating and books and documents are now stored on same without fear of mildew or other deterioration from dampness.

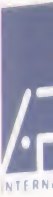
The large Power House for the United Gas & Electric Corporation, located on the banks of the Chemung River, Elmira, N. Y., was Waterproofed by us to resist a hydrostatic head of 15 feet at high water, and recent floods have proven the substructure to remain absolutely dry under this pressure. Owing to the great amount of water which it was necessary to control during the construction of this building, the waterproofing presented many difficult and unique problems.

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